Lucas Trojanowski

Ph.D Candidate, Applied Physics, University of Michigan

Email: lucastro@umich.edu **Github:** https://github.com/lucastrojanowski

University of Michigan (Expected graduation: 2027)

Ph.D. Applied Physics, Advisor: Y Z (Professor of Nuclear Engineering and Radiological Sciences)

University of Illinois at Urbana-Champaign (Graduation: 2022)

MS in Mathematics, Concentration in Applications to the Sciences (3.9 GPA)

University of Illinois at Urbana-Champaign (Graduation: 2020)

BSLAS with High Distinction in Mathematics, Minor in Physics (3.9 GPA)

University of Illinois Campus Honors, University of Illinois James Scholar, Cum Laude

Research Interests:

- Phase transitions, potential energy surface exploration, nonequilibrium processes, rare event sampling
- X-Ray and neutron scattering in condensed matter sciences, molecular dynamics simulations
- Electrolytes, ionic liquids, molten salts, and liquids for sustainable energy applications
- Machine learning/high throughput data analysis, quantum chemical computational methods

Publications:

1. **Trojanowski, L.;** Lyu, X.; Lee, S.-C.; Z, Y.; Li, T.; Molecular Origin of Nanoscale Ordering of LiTFSI Electrolytes Revealed Through SAXS/WAXS and Molecular Dynamics Simulations, *ACS Energy Letters*. **DOI**: https://doi.org/10.1021/acsenergylett.4c03022
2. Nguyen, H.; Lee, S.-C.; Lyu, X.; Fang, L.; **Trojanowski, L.;** Gonzalez, R.; Harr, M.; Naumenn, E.; Rai, L.; Z, Y.; Li, T.; *Universal Ion Behavior in Aqueous Electrolytes Driven by Ion Clustering*, Nature **(in review)**

Posters and/or Presentations:

1. **Trojanowski, L.;** Lee, S.-C.; Falus, P.; Leao, J; Faraone, A; Z, Y; Unusual Dynamics of Tetrahedral Liquids Caused by the Competition between Dynamical and Structural Heterogeneity*, American Conference on Neutron Scattering***,** June 2023
2. **Trojanowski, L,** Lee, S.-C.; Falus, P.; Leao, J.; Faraone, A.; Z, Y; Unusual Dynamics of Tetrahedral Liquids Caused by the Competition between Dynamical and Structural Heterogeneity, *American Physical Society (APS) March Meeting***,** Mar 2023
3. **Trojanowski, L.;** Dailey, N.; Chen, R.; Craven, G.; Flow Field Analysis of Nonequilibrium Chemical Dynamics, *Los Alamos National Laboratory X-Computational Summer School***,** Aug 2022
4. **Trojanowski, L**.; Guo, A.; Cao, J.; Shtern, S.; Kundu, A.; Culver, D.; Finite Sub-algebras of the Steenrod Algebra, *Illinois Geometry Lab,* May 2020 (Virtual)
5. Bernard, J.; **Trojanowski, L.;** Song, B.; Ayala, E.; Shakan, G.; Erdogan, B.; Tzirakis, N.; Talbot Effect in Dispersive Partial Differential Equations*, Illinois Geometry Lab,* Dec 2018

Teaching Experience:

1. University of Michigan Department of Physics Guided Reading Course Instructor: Self-Titled *Fundamentals of X-Ray and Neutron Scattering in Condensed Matter Systems* (2024)

2. PHYS 402 - Quantum Mechanics II - Teaching Assistant/Grader - University of Maryland College Park (2022-2023)
3. PHYS 122 - Fundamentals of Physics II - Teaching Assistant/Grader - University of Maryland College Park (2022-2023)
4. MATH 241 - Calculus III - Teaching Assistant/Grader - Netmath UIUC (2020 - 2021)
5. MATH 231 - Calculus II - Teaching Assistant/Grader - Netmath UIUC - (2020 - 2021)
6. MATH 221 - Calculus I - Teaching Assistant/Grader - Netmath UIUC - (2020 - 2021)

Awards, Honors, and Grants:

1. **Los Alamos Computational Sciences Fellowship (2022)**
   Supports a summer-long research project through the Los Alamos National Laboratory's (LANL) X-Computational Sciences Division's Summer School. Worked in collaboration with Galen Craven of the LANL T1 Division to study chemical potential energy surfaces driven into nonequilibrium by pulsed lasers
2. **Vincent O. Greene Department of Mathematics Scholarship (2016-2020)**
   Awarded to 2 undergraduate mathematics students based on academic merit
3. **University of Illinois College of Liberal Arts and Sciences James Scholar (2016-2020)**
   Awarded to undergraduate students based on academic achievement
4. **University of Illinois Chancellor's Scholar (2016-2020)**
   Awarded to 100-150 freshmen based on academic merit in their respective area of study. Requires completion of advanced coursework through the honors college, maintenance of a GPA above 3.5, involvement in community service activities, outreach programs, and/or cultural activities
5. **University of Illinois Dean's List (2016-2020)**
   Awarded to top 20% of undergraduate students, based on GPA
6. **Chicago Blackhawks Alumni Association Keith Magnuson Scholarship Recipient (2016)**
   Awarded to a rising undergraduate freshman based on academic achievement, community service, character, leadership, financial needs, and performance in hockey

Previous Positions:

1. **Graduate Researcher - Y Z Lab - University of Michigan, Department of Nuclear Engineering and Radiological Sciences (2020, 2022-Present)**
   a. Perform molecular dynamics simulations of electrolyte solutions, molten salts, and glass-forming liquids. Conceptualize, manage, and perform neutron scattering experiments into various glass forming liquids. Experience includes using neutron spin-echo spectroscopy and polarized neutron beam analysis.
2. **Visiting Graduate Researcher - Galen Craven Lab - Los Alamos National Laboratory, T1 Division (2022)**
   a. Performed simulations of model molecular potential energy surfaces driven into nonequilibrium by molecular dipole interaction via a pulsed laser source. Used Lagrangian Descriptors to analyze nonequilibrium chemical dynamics and potential energy surface transition state exploration.
3. **Graduate Researcher - Yifei Mo Lab - University of Maryland College Park, Department of Materials Sciences and Engineering (2021)**

    a. Studied performance of various neural network architectures and error evaluation metrics for material property prediction. Predicted stability of silicon lattice polymorphs based on CHGNET, SCHNET, DeepMD, and other artificial intelligence models when compared to DFT calculations and Materials Project datasets.
4. **Graduate Student Contributor - University of Illinois sPHENIX Collaboration, University of Illinois at Urbana-Champaign Department of Physics**
    a. Advised by Caroline Riedl, used PMT, lock-in amplifier, and image processing software to analyze scintillation spectra for electronic calorimeters for the sPHENIX project at Brookhaven National Laboratory.
5. **Undergraduate Researcher - Illinois Geometry Laboratory, University of Illinois at Urbana-Champaign Department of Mathematics (2020)**
    a. Advised by Dominic Culver, created algorithms for creating finite subalgebras of the Steenrod Algebra by iteratively generating elements via Adem Relations.
6. **Undergraduate Researcher - Illinois Geometry Laboratory, University of Illinois at Urbana-Champaign Department of Mathematics (2018)**
    a. Advised by Burak Erdogan and Nikolaos Tzirakis, evaluated fractal-like behavior of solutions to dispersive PDEs based on Fourier decompositions. Provided experimental evidence for an upper bound on the Minkowski dimension of solutions based on dispersion relation of various PDEs including the Schrödinger and Airy equations.

Coding Languages: Python, Bash, MATLAB, Mathematica, C++
Computational/Data Analysis Packages: LAMMPS, Gaussian/Gaussview, VASP; OpenMP, MPI; MDAnalysis; Nequip, Allegro, DeepMD;
Hobbies: Playing chess; reading fiction, poetry, and horror stories; ice hockey;